

From: [DeCair, Sara](#)
To: [Hernandez-Quinones, Samuel](#)
Subject: RE: Water conversation follow ups
Date: Wednesday, May 14, 2014 8:35:40 AM
Attachments: [Joint Briefing PGrevatt-Flynn May-14 Sara cmts.docx](#)

Sam, this looks great -- I added a couple tiny things. Want to talk today at about 12:30 pm about the writeup you're working on? I think I can be helpful...

Sara

-----Original Message-----

From: Hernandez-Quinones, Samuel
Sent: Tuesday, May 13, 2014 1:09 PM
To: DeCair, Sara
Subject: RE: Water conversation follow ups

Hi Sara,

I'm still working on the write-up for the comparison to the Food Number, as soon as I'm done I will forward to you.

Please see attached. Let me know if you have any comments.

Sam

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"USEPA Protecting Human Health and the Environment"

-----Original Message-----

From: DeCair, Sara
Sent: Monday, May 12, 2014 4:17 PM
To: Edwards, Jonathan; Veal, Lee; Burneson, Eric; Christ, Lisa; Hernandez-Quinones, Samuel; Ellis, Jerry
Cc: Ferguson, Rafaela
Subject: Water conversation follow ups

Thanks everyone, again, for your time this afternoon. I'm sending along the US/International PAGs comparison chart that was designed to help produce public messages around how and why our PAGs might differ from another country's. You'll see within it that there is a Water line, where we tried to boil down the relevant pieces of US and International guidelines for that pathway:

Overall guide for Relocation, Food and Water combined: 100 mSv/year dose averted (100 mSv full term in utero) = 10 rem/year

Action: Temporary relocation or alternative food and water supplies Recommend use of Operational Intervention levels (OIL) derived to 10 mSv/year = 1 rem/year to assure combined pathways do not exceed overall guide &

Reference levels in the range 1-20 mSv/year
100 mrem-2 rem/year

So to make a little more clear what I hoped to convey in our Water briefing, we could try this:

100 mrem to 2,000 mrem = Range of international guidelines for water to keep total doses below 10,000 mrem
(IAEA, ICRP)

Of course I am open to suggestions on how to best convey that 500 mrem is essentially middle of the road, by no means at the top of any range!

Have a marvelous afternoon,

Sara

DRAFT

Joint Briefing
Drinking Water Radiation Protective Action Guide
May 20, 2014

Purpose:

- Provide options for selecting a drinking water PAG.
- Seek guidance on process to solicit public comment.

Recommendations:

- Recommend that a “do not drink” PAG level for sensitive sub-populations (Children and Infants) be informed on the projected risk levels from exposure to drinking water. Other protective action (i.e. “do not drink for general population) could also be informed on projected risk levels.
- Recommend that I-131 and Cs-137 be used by EPA decision makers for assessing risks for the radiological incidents covered in the PAG manual; once the dose at the acceptable risk level is selected, the dose can be converted to a concentration for nuclides of concern.
- Recommend an exposure time frame of one year to assure consistency with the other intermediate phase components of the PAG.
- Recommend that Drinking Water PAG proposal be issued for public comment separately from the final PAG document. After comments are received on the Drinking Water Proposal, a revised Water PAG will be incorporated into the final PAG Manual and publicly issued for use.

Scenarios Evaluated:

EPA’s contractor prepared extensive tables to evaluate multiple radiation scenarios. For example the tables assessed:

- Different event durations (i.e., 30 days, to 365 days)
- Different subpopulations, different dose levels, & different nuclides of concern

Findings from Assessment - Drinking Water PAG:

Iodine-131

*SDWA Derived MCL Concentration 3 pCi/L

Dose (mrem)	4 mrem	75 mrem	500 mrem
Subpopulation Highest Risk	Infant	Infant	Infant
Projected Risk	4.67E-06	8.70E-05	5.84E-04
Concentration (pCi/L)	84	1,580	10,500
Most Restrictive Concentration (pCi/L, 5 yr old)	52	985	6,570
Projected Risk for 5 yr old	4.08E-06	7.65E-05	5.10E-04
Projected Risk for Adult	8.40E-07	1.57E-05	1.05E-04

Cesium-137

*SDWA Derived MCL Concentration 200 pCi/L

Dose (mrem)	4 mrem	75 mrem	500 mrem
Subpopulation Highest Risk	Infant	Infant	Infant
Projected Risk	6.45E-06	1.20E-04	8.06E-04
Corresponding Concentration (pCi/L, Infant)	735	13,797	91,900
Projected Risk for Adult	1.81E-06	3.40E-05	2.27E-04

Basis for Dose Levels:

4 mrem = Dose for current SDWA MCL

25 mrem = Equivalent to Advisory Level issued in Japan assuming a 90 day exposure (Infants)

75 mrem = Proportion of the FDA food PAG attributed to drinking water

100 mrem = Equivalent to Advisory Level issued in Japan assuming 365 day exposure (Infants)

250 mrem = Equivalent to Advisory Level issued in Japan assuming 365 day exposure (Adults)

500 mrem = Dose Value recommended by DHS (for drinking water) & FDA (for Food)

100 mrem to 2,000 mrem = Range of international guidelines for water to keep total doses below 10,000 mrem (IAEA, ICRP)

Note: Even at a low dose level, newer dosimetry and a shorter duration (i.e., one year vs. a lifetime) will result in a PAG concentration orders of magnitude higher than our MCLs for individual nuclides.

Findings:

Exposure Duration:

For low level radiation, the risks do not vary with the duration of exposure. Assuming exposure is distributed over one year yields no difference in risk than if the exposure is 30 days.

- The one year timeframe is consistent with other intermediate phase PAGs.
- Emergency responders will not need to make assumptions about the duration of the event.
- A longer exposure duration will result in a lower allowed concentration while maintaining the projected risk level.

Water Ingestion Rates:

Ingestion rates have been incorporated from Federal Guidance Report #13, which uses mean values for consumption/intake.

- The ingestion rates in Federal Guidance 13 are consistent with ingestion rates in the EPA's Exposure Factors Handbook.

Subpopulation of Concern:

Based on the calculated projections, infants and children 5 years old and younger appear to have the greatest risk from exposure to radionuclides in drinking water.

- A PAG developed to protect infants and children 5 years and younger would also be at least as protective to fetuses and developing embryos.

Calculated Risk Ranges:

Projected risk for excess cancer cases associated with different exposure scenarios were developed for infants, children and adults. The results from these projections of the estimated excess cases of cancer generally fall within the range of risks currently found in our DW Radionuclides Rule (10^{-4} to 10^{-6}) for all projected doses evaluated (e.g., 4 mrem to 500 mrem). This risk would be additive to the overall lifetime risk from drinking water in excess of the MCL.

There are a few exceptions where the risk levels approach the 10^{-3} for dose levels higher than 250 mrem/year.

Timeline for PAGs Publication:

- Draft FR Notice language and PAG Manual water language (**June**)
- Brief AAs, DA as appropriate (**June through July**)
- Brief multi-agency PAGs Subcommittee & get concurrence on proposal (**Late July**)
- Have updated Water proposal reviewed by OSWER, OHS and OGC. (**August**)
- Develop Water proposal *Federal Register* package (**Sept.**)
- OPEI review and facilitation (**Sept.**)
- OMB 90-day Review (**Oct. – Jan.**)
- Finalize edited FR Notice and PAGs Manual (**OMB release + 14 days**)
- Complete *Federal Register* Workflow, including: (**OMB release + 30 days**)
- Compile and adjudicate comments from public review (**OMB release + 60 days**)
- Finalize (**OMB release + 90 days**) (**Apr. 2015?**)

Appendix

Key Terms:

Bq

One becquerel (Bq) is the amount of a radioactive material (atoms or grams) that decays at a rate of 1 disintegration per second.

Ci, pCi, and dps

A curie (Ci) is an expression of the amount of radioactivity that corresponds to that amount of radioactive material (atoms or grams) that has a decay rate of 3.7×10^{10} disintegrations per second (dps). A picocurie (pCi) is one trillionth (i.e., 10^{-12}) of a Ci.

Rem and mrem

A rem is an expression of the amount of ionizing radiation absorbed by tissue multiplied by the a quality factor that takes into consideration the relative potential amount of damage the radiation might cause; a mrem (millirem) is 0.001 rem.

Sv

A sievert (Sv) is 100 rem. Sv is the International System of Units (SI) derived unit of ionizing radiation dose (the rem and mrem are older, non-SI units).

Background Information:

- EPA Maximum Contaminant Level (4 mrem annual dose)
 - For I-131 in drinking water the derived concentration corresponds to 3 pCi/L
 - Based on limiting the dose to the thyroid to 4 mrem/yr
 - Assumes 70-year (lifetime) exposure through drinking water
 - Utilizes dose calculation methods developed in 1958 (ICRP 2)
- Current science (ICRP 72) would calculate the 4 mrem effective dose to the whole body, not a specific organ
 - 55 pCi/L for Children & 120 pCi/L for Adults for I-131
- DW Advisory issued in Japan during Fukushima for Iodine-131 was 100 Becquerel/liter for Infants and 300 Becquerel/liter for Adults (about 2700 pCi/L for Infants & 8000 pCi/L for Adults).
- OGWDW was tasked with developing a PAG (expressed as a dose value) for drinking water which will be included in the EPA PAGs Manual.